L. *Obſervation of the Tranſit of* Venus, June 6, 1761, *at* St. John's, Newfoundland: *By* John Winthrop, *Profeſſor of Mathematicks and Philoſophy at* Cambridge, New England.

Read Nov. 15, 1764.

THE tranſit of Venus over the Sun, being a very curious and important phœnomenon, engaged the attention of America as well as Europe. His excellency Francis Bernard, Eſq; governor of the Maſſachuſetts-Bay, a gentleman who ſeizes every opportunity of advancing the ſciences, was deſirous to have an obſervation of it in this quarter of the world; and as Newfoundland was the only Britiſh plantation where one could be had, propoſed to the General Aſſembly at Boſton to make proviſion for that purpoſe, which they readily agreed to do. In conſequence whereof, I imbarked on board a veſſel in the ſervice of the government, taking with me for aſſiſtants two young gentlemen my pupils; and ſuch aſtronomical inſtruments out of the college apparatus as were neceſſary. Theſe were, an excellent clock, Hadley's octant with nonius diviſions; a refracting teleſcope with wires at half right angles, for taking differences of right aſcenſion and declination; and a nice reflecting teleſcope, adjuſted by croſs levels, and having vertical and horizontal wires, for taking correſpondent altitudes; or differences of altitudes and azimuths.

We

We arrived at St. John's Newfoundland the 22d of May, where we met with a very kind reception, and all the aſſiſtance we could deſire. As this town is bounded with high mountains toward the ſun-riſing, ſo that no houſe in it would anſwer our end, we encamped on an eminence at ſome diſtance, from whence we could ſee the Sun preſently after his riſing.

Hither we conveyed our inſtruments, and ſecured the clock to a pillar ſet in the ground under a tent. Near this tent, and within call of the clock, we fixed two other pillars firmly in the ground; one, to mount the refracting teleſcope on; the other, which was above 8 feet high, for a ſtyle or gnomon, having at top a plate of lead with a little hole for tranſmitting the Sun's rays; and we laid an horizontal platform to receive thoſe rays. The platform we kept covered, to defend it from the Sun and weather: and examined its poſition every time we made uſe of it, by a very long level. On this we carefully drew a meridian line, by correſpondent altitudes of the Sun, taken both by the reflector and by the Sun's image on the platform. Theſe operations we repeated every fair day, and ſeveral times in a day. It would be tedious, as well as needleſs, to give a detail of them: 'tis ſufficient that we adjuſted the clock with as much exactneſs as we could have done at home.

Thus prepared, we waited for the critical hour, which proved favourable to our wiſhes. The morning was ſerene and calm. The Sun roſe behind a cloud that lay along the horizon, but ſoon got above it; and at 4^h $18'$ we had the pleaſure of ſeeing *Venus on the Sun*; though dimly indeed at firſt. But

the planet preſently became diſtinct, and her limb well defined. Upon this, I applyed myſelf to obſerve the paſſage of the Sun's and Venus's preceding limbs, by the vertical, and of their lower limbs by the horizontal, wires in the reflector, and made the following obſervations; one of my aſſiſtants counting the clock, and the other writing down the obſervations as I made them; which, having made the proper correction of the time for the change of the Sun's declination, ſtand as follows.

True time. h ′ ″		diff. long. ☉ & ♀ ′ ″	♀ Lat. South. ′ ″
At 4 21 20	Sun at the vertical ——		10 47
31	Venus at the ſame ——	9 2	
23 6	Venus at the horizontal –	9 4	10 50
24 23	Sun at the ſame. ——		
27 29	Venus at the horizontal –	9 25	10 52
28 47	Sun at the ſame ——		
35 15	Sun at the vertical ——		10 55
21	Venus at the ſame ——	9 56	
37 49	Venus at the horizontal –	10 8	11 00
39 9	Sun at the ſame — ——		

As Venus began now to draw near the Sun's limb, I prepared to obſerve her egreſs. The interior contact did not appear ſo perfectly inſtantaneous, as Dr. Halley's papers led me to expect. I was not certain of it till $4^h\ 47'\ 21''$, though I doubted of it at $17''$. The exterior contact I judged to be at $5^h\ 5'\ 49''$, doubtful alſo 3 or $4''$; and ſo the paſſage of Venus's diameter, $18'\ 28''$.

The above obſervations gave me ſeveral altitudes and azimuths of Venus, from whence I deduced her

right aſcenſions and declinations; and from them, her longitudes and latitudes. The reſult of the whole, or the planet's difference in longitude from the Sun's centre and her latitude, is ſet down above, againſt each obſervation of Venus.

From hence I concluded that at the central emerſion, which I put at $4^h\ 56'\ 38''$, the difference of longitude was $11'\ 19$, and the latitude $11'\ 6''$. Alſo, that the conjunction in longitude happened at $2^h\ 4'\ 36''$, the planet's latitude then being $9'\ 28''$.

In theſe calculations, I ſuppoſed the ſemidiameter of the Sun to be $15'\ 50''$, and of Venus $29''$.

By ſeveral obſervations, I found the latitude of the place $47^\circ\ 32'$ N; which falls within the latitudes laid down in ſeveral books and maps, which make it from $47^\circ\ 25'$ to $48^\circ\ 0'$. I could make no uſe of Jupiter's ſatellites in finding the longitude, as they were not riſen high enough to be obſerved above an hour before day-light came on. There were but two of their eclipſes that could have been viſible there while I was on the iſland; and though I watched for both of them, I was diſappointed of both by unfavourable weather. Neither was I fortunate enough to get ſo much as one occultation of a fixed ſtar by the Moon, though I ſpared no pains for it. The only obſervation I could get for this purpoſe was of the right aſcenſion of the Moon, which I endeavoured to find, by comparing with that of a fixed ſtar. But whether any miſtake was committed in counting the clock, or in writing down the obſervations, or whether the poſition of the teleſcope was diſturbed by any accident in the interval between the Moon's and ſtar's paſſing, I am not able now to ſay. However, as I am ſenſible that

that obſervation is not to be depended on, I think it needleſs to inſert it here. The longitude of St. John's is variouſly ſet down by different authors, though none I have met with mention the obſervations by which it was determined. According to Sir Jonas Moore, it is 52^h 50′ Weſt from Greenwich; and as his authority may be as good as any, I keep to this longitude till it can be aſcertained by farther obſervations. I have taken meaſures to procure ſuch; and if they ſucceed, ſhall be ready to communicate the reſult.

I viewed the Sun with great attention in the reflector both on the 5th and 6th of June, in hopes to find a ſatellite of Venus; but in vain. There were ſeveral ſpots then on the Sun; but none that I ſaw could be a ſatellite.

The variation of the needle there I found 19° W.

J. Winthrop.

REMARK.

Mr. Short has computed the parallaxes at the egreſs for this obſervation at St. John's, and by comparing this obſervation with that at the Cape of Good Hope (on the above longitude and latitude of St. John's as ſet down by Mr. Winthrop) he finds the parallax of the Sun, reſulting therefrom, $= 8'',25$.